

CLAIMS

1. A curable resin composition,
which contains an epoxy resin, a solid polymer having
5 a functional group to react with an epoxy group and a
curing agent for an epoxy resin, no phase separation
structure being observed in a matrix of a resin when a
cured product is dyed with a heavy metal and observed with
a transmission electron microscope.
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2. The curable resin composition according to claim
1,
wherein the cured product has a single $\tan\delta$ peak in
viscoelasticity spectrometry and the temperature of the
15 peak is 120°C or higher.
3. The curable resin composition according to claim
1 or 2,
wherein the cured product has a swelling ratio of 50%
20 or less measured in a dimethyl sulfoxide solution heated at
120°C.
4. The curable resin composition according to claim
1, 2 or 3,
25 wherein extracted water obtained by extracting an
eluting component of the cured product with hot water at
110°C has pH not lower than 5.0 and lower than 8.5.
5. The curable resin composition according to claim
30 1, 2, 3 or 4,
wherein extracted water obtained by extracting an
eluting component of the cured product with hot water at
110°C has an electric conductivity of 100 $\mu\text{S}/\text{cm}$ or lower.
- 35 6. The curable resin composition according to claim

1, 2, 3, 4 or 5,

wherein the cured product has a dielectric constant of 3.5 or lower and a dielectric loss tangent of 0.02 or lower.

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7. The curable resin composition according to claim 1, 2, 3, 4, 5 or 6,

wherein the epoxy resin is an epoxy resin having a polycyclic hydrocarbon skeleton in the main chain and the solid polymer having the functional group to react with the epoxy group is a high molecular polymer having an epoxy group and no inorganic filler is contained.

8. The curable resin composition according to claim 7,

wherein the epoxy resin having a polycyclic hydrocarbon skeleton in the main chain is an epoxy resin having a dicyclopentadiene skeleton or an epoxy resin having a naphthalene skeleton.

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9. The curable resin composition according to claim 7 or 8,

wherein the high molecular polymer having an epoxy group has a weight-average molecular weight (Mw) of 10,000 or higher.

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10. The curable resin composition according to claim 7, 8 or 9,

wherein the high molecular polymer having an epoxy group has an epoxy equivalent of 200 to 1,000.

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11. The curable resin composition according to claim 7, 8, 9 or 10,

wherein the high molecular polymer having an epoxy group is produced by suspension polymerization method.

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12. The curable resin composition according to claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 or 11,

which further contains a low elastic modulus
5 substance having elastic modulus (G') in a range of 1×10^5
to 1×10^8 Pa at 20°C , the low elastic modulus substance
being dispersed like an island in non-compatible state with
the epoxy resin and the solid polymer having the functional
group to react with the epoxy group.

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13. A curable resin composition,
which contains an epoxy resin composition obtainable
by mixing an epoxy resin having a dicyclopentadiene
skeleton, an epoxy resin having a naphthalene skeleton and
15 a curing agent for an epoxy resin, and rubber particles
having a core-shell structure, the core having a glass
transition temperature of 20°C or lower and the shell
having a glass transition temperature of 40°C or higher.

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14. An adhesive epoxy resin paste,
which comprises the curable resin composition
according to claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 or
13.

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15. An interlayer adhesive,
which comprises the adhesive epoxy resin paste
according to claim 14.

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16. A non-conductive paste,
which comprises the adhesive epoxy resin paste
according to claim 14.

17. An underfill,
which comprises the adhesive epoxy resin paste
35 according to claim 14.

18. An adhesive epoxy resin sheet,
which is obtainable by forming the curable resin
composition according to claim 1, 2, 3, 4, 5, 6, 7, 8, 9,
5 10, 11, 12 or 13 in a sheet form.

19. The adhesive epoxy resin sheet according to
claim 18,
wherein a heat-cured product obtained by heat curing
10 at a temperature rising rate of 45°C/min has a storage
modulus (G') exceeding 1×10^3 Pa.

20. The adhesive epoxy resin sheet according to
claim 18 or 19,
15 wherein the peak temperature of $\tan \delta$ based on dynamic
viscoelasticity is in a range of -20°C to 40°C before
curing and 120°C or higher after curing.

21. A non-conductive film,
20 which comprises the adhesive epoxy resin sheet
according to claim 18, 19 or 20.

22. A die attach film,
which comprises the adhesive epoxy resin sheet
25 according to claim 18, 19 or 20.

23. A conductive connection paste,
wherein conductive fine particles are contained in
the adhesive epoxy resin paste according to claim 14.
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24. An anisotropic conductive paste,
which comprises the conductive connection paste
according to claim 23.

35 25. A conductive connection sheet,

which comprises the adhesive epoxy resin sheet according to claim 18, 19 or 20 and conductive fine particles, at least a part of the conductive fine particles being exposed out of the adhesive epoxy resin sheet.

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26. A conductive connection sheet,
which is obtainable by embedding conductive fine particles smaller than the thickness of the adhesive epoxy resin sheet in the adhesive epoxy resin sheet according to
10 claim 18, 19 or 20.

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27. An anisotropic conductive film,
which comprises the conductive connection sheet according to claim 26.

28. A conductive connection sheet,
which is formed by a pressure sensitive adhesive resin sheet comprising a pressure sensitive resin composition containing a resin provided with a pressure
20 sensitive adhesive property by addition of a plasticizer and an epoxy resin having a naphthalene skeleton in liquid phase at normal temperature and conductive fine particles, the pressure sensitive adhesive resin sheet having a peak
25 temperature of $\tan\delta$ based on dynamic viscoelasticity in a range of -20°C to 40°C before curing and 120°C or higher after curing and the conductive fine particles being
arranged at any positions of the pressure sensitive adhesive resin sheet and at least a part of the conductive fine particles being exposed out of the pressure sensitive
30 adhesive resin sheet.

29. The conductive connection sheet according to claim 28,
wherein the pressure sensitive adhesive resin sheet
35 after curing has an elongation percentage of 5% or lower

after a pressure cooker test carried out under conditions of a temperature of 120°C and a humidity of 85% RH for 12 hours.

5 30. A flip chip tape,
 which comprises a conductive connection sheet
 according to claim 25, 28 or 29.

 31. An electronic component joined body,
10 which is obtainable by joining a bump-shaped
 projected electrode of an electronic part to another
 electrode in electrically connected state by any of the
 curable resin composition according to claim 1, 2, 3, 4, 5,
 6, 7, 8, 9, 10, 11, 12 or 13, the adhesive epoxy resin
15 paste according to claim 14, the interlayer adhesive
 according to claim 15, the non-conductive paste according
 to claim 16, the underfill according to claim 17, the
 conductive connection paste according to claim 23, the
 anisotropic conductive paste according to claim 24, the
20 adhesive epoxy resin sheet according to claim 18, 19 or 20,
 a non-conductive film according to claim 21, the die attach
 film according to claim 22, the conductive connection sheet
 according to claim 25, 26, 28 or 29, the anisotropic
 conductive film according to claim 27 and the flip chip
25 tape according to claim 30.

 32. An electronic component joined body,
 which is obtainable by joining at least one kind
 circuit substrate selected from a group consisting of a
30 metal lead frame, a ceramic substrate, a resin substrate, a
 silicon substrate, a compound semiconductor substrate, and
 a glass substrate by any of the curable resin composition
 according to claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 or
 13, the adhesive epoxy resin paste according to claim 14,
35 the interlayer adhesive according to claim 15, the non-

conductive paste according to claim 16, the underfill
according to claim 17, the conductive connection paste
according to claim 23, the anisotropic conductive paste
according to claim 24, the adhesive epoxy resin sheet
5 according to claim 18, 19 or 20, a non-conductive film
according to claim 21, the die attach film according to
claim 22, the conductive connection sheet according to
claim 25, 26, 28 or 29, the anisotropic conductive film
according to claim 27 and the flip chip tape according to
10 claim 30.

33. The electronic component joined body according
to claim 32,

wherein the resin substrate is a glass epoxy
15 substrate, a bismaleimidetriazine substrate or a polyimide
substrate.